ABB Robotics Singapore
ABB Robotics Singapore : Business Segment

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<th>Solar</th>
<th>Force Control</th>
<th>Metal Fabrication</th>
<th>Consumer Industries</th>
<th>Plastics</th>
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Dedicated After-Sales Service and Support

- Market-leading positions in Key Application Segment.
- Extensive robotic experience, solutions and capabilities.
- Our strength is in Engineering, Project Management, Installation & strong After-sales service support.
- Complete product line-up with strong R&D focus.
Major Customers

- Wafer & Solar Cell handling
- Auto Soldering (Cell matrix)
- Edge trimming
- Glass & Module handling
Force Control / Metal Fab

- FlexFinishing
- Aerospace MRO
- Welding
- Machine Tool Industry
- Water-Jet Cutting
- Shot Peening
- Thermal Spraying

Major Customers

- SAESL
- Singapore Technologies Aerospace
- Goodrich
- Sulzer Metco
- AST
- Jeesen & Jessen
- FAST
- Rösler
- KMT Cutting Systems
- AMT Advanced Materials Technology
- ABB
Consumer Industries

- Picking
- Packing
- Palletizing

Major Customers

![gsk GlaxoSmithKline](#)  ![Baxter](#)  ![Nestle](#)  ![Unilever](#)  ![hp](#)

![Pfizer](#)  ![AstraZeneca](#)  ![P&G](#)  ![British American Tobacco](#)  ![Seagate](#)
Plastic

- Cutting and finishing
- Machine tending
- Flaming / Painting
- Assembly / Gluing
- Inspection / Quality Control

Major Customers

- Conair
- ECCO
- Sunningdale Tech Ltd
- Cannon Far East
- Intec
- First Engineering
- Rim Polymers Industries Pte Ltd
Consumer Industry

FLEXPICKER with PickMaster 3
PC Based software
Applications within the packaging and distribution supply chain of Consumer Products

- Handling and Packaging of
  - Food & beverage
  - Pharmaceuticals & medical
  - Personal care & cosmetics

- Consumer Electronics – Handling and Packaging of
  - Telecommunications
  - Personal & Home Electronics

- Distribution and Logistics
Market Leader in High Speed Picking

One stop solution
- Picking, Packing and Flexible Material Handling

Shortest Time To Market
- Shortest programming time

Best Machine-builder offer
- High speed picking
- Readily solution for Easy integration
PickMaster 3

- Developed in 2000
  - Version 2.0 since 2002, latest version 3.2
- PC based software and controller ProcessWare
  - Works together with all kind of ABB-robots
  - Easy-to-use configuration for flexible packaging lines
  - High performance robot process co-ordinator
- Powerful vision and inspection system
- Meets priority demands in packaging
  - Production stability
  - Flexibility
Benefits and Value to Customers

- Vision & conveyor tracking
  - Fully random conveyor production flows
- Standard vision tool
  - General purpose vision robot guidance
  - Non tracking applications
- Easy-to-use conveyor tracking
  - Without vision
One PickMaster - many robots

- Process co-ordination of multiple robots
  - 8 robots, 8 cameras
  - 6 conveyors per robot
  - S4CPlus or IRC5
  - All robot types
  - Supports MultiMove
Simplifies your packaging

PickMaster 3 – The turnkey software product for flexible packaging
Large installed base

- Controlling >1200 Robots world wide (Yr2007)
- Industries
  - Food
    - Bakery: pizza, croissant, pretzel
    - Frozen/fresh meat, sausage, chicken, fish
    - Diary, chewing gum, candy, ice cream, chocolate
  - Pharmaceutical/Medical
    - Syringes
    - Sterile tissues, wound protection
  - Personal Care/Others
    - Wet tissue, razor head
Strong PickMaster Volume Growth

- Steady growth since 2001
- 23% increase from 2006 to 2007 (269->332)
- >1200 PickMaster controlled robots installed
- >40 integrators, >20 countries

“PickMaster is the best and most efficient automation software in all categories”
Peter Larsson, FlexLink Sweden

“Can you apply PickMaster on an Adept controller?”
Farason Corp., USA
References
Successful installations

Scoop inserter system

Jorgensen

Simplot

ABB
PickMaster 3

- Ease-of-Use
- Vision and Inspection
- Process control
- Conveyor Tracking
- Seamless Integration with robot controller
- Flexibility
Ease-of-Use

- GUI – Point and Click / Drag and Drop
- Structured separation of line and file
- Seamless integration with the robots
- Communication
- Calibration
- Conveyor Tracking
- RAPID Template
Vision

- Calibration
- Geometric models
- Inspection
- Robustness
- High Resolution 1024x1280 cameras
Cognex – Market Leader in Vision Technology

- ABB Partnership on PC vision since 1998
- Broad product range from ID-tools to PC-vision
- Strong in geometric feature recognition
  - Under difficult conditions
  - Very fast full 360 deg rotation

PickMaster
IRC5 with Prep for PickMaster
Hardware configuration

- Vision frame grabbers for mounting in a standard PC.
  - Max two frame grabbers boards per PC
- Digital -> best choice for up to 6 cameras
  - Combine Single/Double/Triple
  - High resolution CMOS cameras and cables included
- Analogue -> up to 8 cameras
  - Four camera board, no cameras included
PickMaster Vision: What does it do?

- Camera Calibration
- 2D Part Location from stationary cameras
  - Geometric
  - Blob
- Feature Inspection
  - Inspection I: Parameter boundary conditions
  - Inspection II: Base model with several Inspection model
    - Geometric, Blob, Grey scale, Size
Vision Modeling
Product distinction
Product separation
Distinguishing the details: Inspection II
PickMaster 3: Made for Speed on the Fly

- PC based software and IRC5 ProcessWare
- Efficiency and speed
  - Internal position transfer pipe
  - Built-in real-time functions
- Tracking
  - PickWare conveyor tracking
    - Highest conveyor speed
    - Largest work envelop
    - Safe boundary checks
- Maintained flexibility
  - RAPID
  - SDK
  - .NET User Hooks
Moving conveyor frame synchronization

- Trigger from external, store the current time
- Strobe to conveyor board frame trigger
- Strobe event to PickWare
- Scene info sent to the host
- Correct frame tag is coordinated to local positions and sent to the controller queue
  - Coordination through IEEE1588
Operation Interface

- **RIS – Remote Integration Services**
  - Enables safe operation on custom panels
  - Integration into larger line control systems
  - Run panel on
    - PickMaster PC screen
    - Remote panel
      - Fieldbus / serial link / Ethernet

Sample code on CD
Flexible Process Platform

- PickMaster provides powerful customization interfaces
  - PickMaster SDK
    - External Models
      - Custom vision models
    - External Sensors
      - Custom vision systems
  - User Hooks with .NET
    - Dynamic adaptions of positions and types
    - Process enhancement examples
      - Interaction with external devices, e.g. Quality systems, check weighing, ordering, barcode readers, e.a.
      - Analysis of multiple vision models
Pre-scheduling of work

- Load Balancing
  - Optimizes robot load
  - Cost efficient camera distribution
  - Less CPU load
  - Dynamic redistribution of production

[Diagram of load balancing with Cam/Sensor and Load Balancing text]
Never miss a product or pocket

- Adaptive Task Completion - ATC
  - Progressive and dynamic filling of patterns
    - Dynamically allocated positions per robot
  - Full packages guaranteed
  - Dynamic redistribution of all positions
Factors for Increasing Line Efficiency

Efficiency:
„Number of packed products in relation to the required resources“

- Product flow
  - consistent product flow
  - low speed of product band and tray belt
  - quality of products (recognize ability, pick ability, ...)
- Packaging line layout
- Effective positioning of robots in a layout
Without Pickmaster 3 ..... is not easy to fulfill due to boundary conditions and external disturbances:

- Variations in product and tray flow:
  - Oscillations of product rate (high / low frequency)
  - Missing / bad items
  - Starting up / shutting down a line

- Layout of packaging line

- Other restrictions like:
  - Specific placing order of different product types
  - Placing of cushions between trays, ...

- Handling of delicate products might be tricky

- Malfunctions of system components
  - Down-Times (MTBF, MTTR)
Designing and Optimizing a Picking-Line

Analyzing the product flow and, if possible, adequate minimizing of fluctuations

Designing an optimal layout for the customer

Fine-tuning of the system through optimized positioning of the robots and choosing the right Pick&Place strategies
Quality of Product Flow:

Correlations seem to be simple…

Products_{in} = Products_{out}

Products_{\text{min}} \cdot V_{\text{Productbelt}} = Trays_{\text{min}} \cdot V_{\text{Traybelt}} \cdot Products_{\text{Tray}}
Gatekeeper with shortest Pick&Place distance

- Collision!
Gatekeeper with shortest Pick&Place distance

Work area definition in order to prevent collision

Optimized Pick&Place strategies
Mono-Lines

- Product flow
  - Parallel flow
  - Counter flow
- Regular
- Irregular
Cross Feeding vs. Parallel Feeding

- Optimal work areas
- Autonomous stations

- Better accessibility
- Less resources
- No merging of trays

[Diagram showing the comparison between Cross Feeding and Parallel Feeding]
Pickmaster 3 Offering

- Software
  - Real time Process Control
  - Ease of Use configuration
- Vision System
- Conveyor Tracking
- Seamless Robot Integration